The Horizontal Loop

(The best kept secret in amateur radio circles!)

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IN 1990 I WAS LUCKY ENOUGH to make it to the Dayton Amateur Radio Convention in Ohio USA. Whilst there I picked up a copy of the *ARRL Amateur Radio Handbook,* 1990 edition, and browsed through it during a long and dreary flight back across the Pacific to Australia. I finally came across the chapter, "Antenna Projects", and noticed glowing reports on the use of full wavelength horizontal loops; indeed the author said that they were "the best kept secret in amateur radio circles".

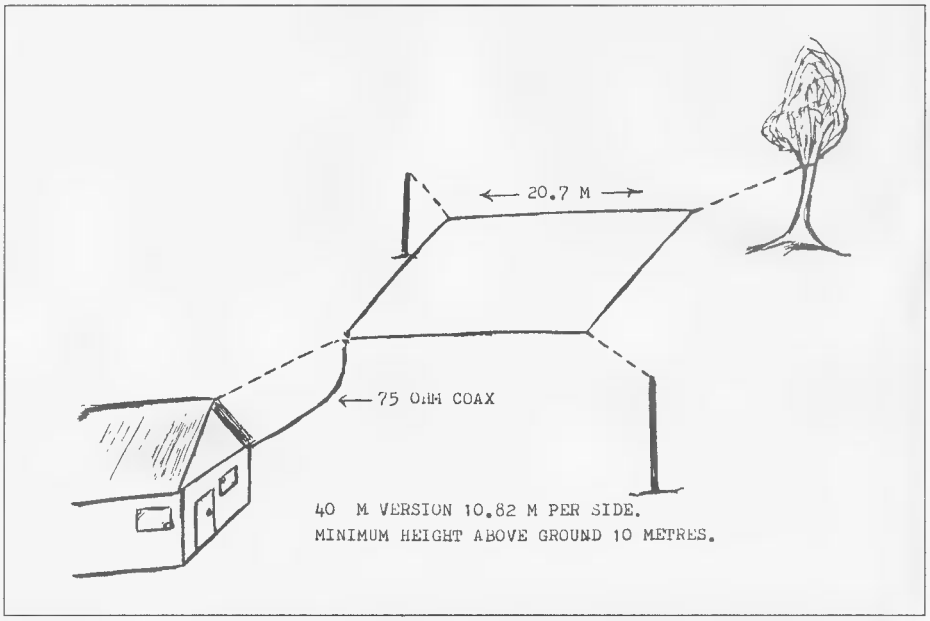
It reminded me that I had a collection of articles and correspondence on this type of antenna, gathered over a long period from contacts in the United States and Europe. There and then, crammed amongst 400 other unfortunate travellers enduring what passes for air transportation these days, I resolved to make it a project for the year.

The first reference to the use of these loops came to my attention from an article in *73* magazine, June 1978 issue. A German amateur DL3ISA took 83 metres of antenna wire and mounted it in the form of a big quad about 10 metres above the ground in a horizontal position. Each leg was 20.7 metres in length, and he fed it with 75ohm cable of random length from one of the corners, as shown in the accompanying diagram. He noted that the preferred propagation occurs off the extensions of the quad's diagonals.

In 1985 Dave Fischer W0MHS reported in the November issue of *QST* that he had used this type of antenna since 1957 in many locations and that it was a "magnetic" version of the old super Skybuster, the open-wire, centre-fed, "electric" Zepp that had performed so well for decades. Subsequently, Curt Wilson W0KKQ wrote in *World Radio,* September 1986 issue, under the heading "A Closer Look at Horizontal Loops", some interesting comments about the "re-discovery" of this super antenna which had been there all along. So much for the background.

Construction

The erection of a loop at my own property proved to be easier said than done. A Rhombic was already in use but although I was prepared to dismantle it, the diamond configuration of the poles did not allow a quad shape without an extremely long feed-line. So, the first opportunity I had of personal experience with the loop came when a mate, Tony VK4AJB advised that he had bought a few acres of land east of the city of Gympie and wanted some ideas about a suitable all-band antenna. I sent him the paperwork and arranged a weekend visit to assist.We finished the job late on the Saturday afternoon, after an expert bow and arrow performance by VK4AJB, shooting fishing line up over the selected gum trees and drawing up the necessary ropes to hoist this secret weapon. It was the middle of the Queensland winter and the sun was already low in the western sky when we adjourned into the "carashack", an old caravan used as our headquarters. As I sipped s Scotch, I reflected that I would probably cop a lot of stick if this thing didn't work as I had promised.



The auto-tune facility on the Kenwood TS440 resonated the 80m band followed by 40, 30, 20, 12 and the 10m band. It refused point blank to have anything to do with the WARC 18MHz allocation. Our first contacts were on 20 metres, and each station called responded promptly with reports of S6 or better. We spoke with a number of DL stations and checked in on the South American DX net. Transferring our operations lower in frequency we had good reports on 40 and 80m and, as the evening wore on, it became clear that this was a good all-band antenna and a pleasure to use. We had a brief QSO with one of the northern NSW stations on 160m, and finally plugged the antenna into the 2m mobile FM transceiver and raised the Sunshine Coast Repeater System some 40 miles to the south.

Subsequent weekends have proved the value of the horizontal loop as a cheap, easy-to-erect all-band antenna. We have since experimented with a full wave loop for 160m, but results have been inconclusive at this stage. Also, we made a trip to the Gold Coast and put up a 40m loop for Colin VK4AGH, who has been more than happy with the results. This antenna at 35 feet per side might appeal to those who are short of space. The formula for these loops is given as 306 divided by the frequency in MHz, or, for the oldtimers, 1005 over F, giving the answer in feet. Be prepared to cut off a couple of metres due to these formulae being for loops over clear earth. Thwarted at putting up a large quad loop at my own location, I have erected a horizontal delta loop 81m in circumference and fed via a 4x1 balun and 50ohm coax. It is too early to really comment on this configuration but it listens quite well and operates on all amateur bands. However, this shape might suit other operators as only three masts are required. Since the performance of a loop depends partly on the total enclosed area, then obviously we cannot expect the delta shape to be as good as the quad referred to in the original articles. **ar**

Further Experiments with Horizontal Loops

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SINCE WRITING THE FIRST PART of this article I have had an opportunity to erect an 80m horizontal loop at my own property and, although it takes many months of observations to come to proper conclusions on any antenna, here are some comments for what they are worth.

It has become clear to me that any antenna is conditioned by its own environment. By this I mean that adjacent buildings, towers, guy wires and trees modify results obtained at other locations. For instance, the identical antenna erected east of Gympie performs well on 10m; here it does not perform all that well, and does not auto-tune with the TS440S transceiver.

I have had communication on most amateur frequencies, with the best results on 20m against the reference antenna which is a TH6DXX. On 40m it outperforms the reference antenna , which is a dipole. While in contact with 9X5NH in Central Africa, on 17m, I noted that the report given me was about the same as those given to other stations in Australia. The loop seems to transmit better than it receives; this may be because the TS440S auto-tunes the transmitter, but not the receiver, without modification.

The Horizontal Loop concept continues to excite attention overseas, and much experimental work has been done. Paul Carr N4PC has done some computer modelling which has now been published in *CQ* magazine. He has also tried the loop with the corner opposite the feedpoint opened. This virtually turns the loop into a rhombic. One bonus from this move was that it became a fairly efficient radiator on 160m. It is, after all, just a dipole now folded back on itself. There can be no argument with the criticism that the loop is just a cloud-warmer on the fundamental frequency of 80m. For this reason, Paul N4PC has come up with further experiments using a $^3/_4$ wave loop. This works out at 51 feet per side, and the immediate result is that the vertical pattern is split into two lobes with maximum radiation at 40°.

The horizontal pattern is essentially omni-directional. It should be noted that Paul uses 450 ohm balanced feedline, whereas here we have tried both RG58 and RG59 coaxial cable.

Paul claims no expertise in antenna theory. He says that in Alabama there is a saying: "If you place a blind hog under an oak tree, it will eventually find an acorn." He thinks he has found his acorn. I will reserve my own decision until many more observations are made here at this QTH. **ar**